

# Advancing the Nuclear Hydrogen Initiative



## The INL: An International Nuclear Energy Technology Center

Since it was first established in 1949 as the National Reactor Testing Station, the Idaho National Laboratory's (INL) core mission has been to research and develop peaceful nuclear energy. That mission has been reinforced in recent years:

- In 1999, INL and the Argonne National Laboratory were designated the nation's lead labs for nuclear reactor technology.
- The 2001 National Energy Policy placed new emphasis on nuclear power as a vital energy source.
- In 2002, Energy Secretary Spencer Abraham designated INL as a Department of Energy Office of Nuclear Energy, Science and Technology lab, with lead

responsibility for Generation IV and Advanced Fuel Cycle Technology research.

### A Vital Nuclear Energy Portfolio

INL maintains a full spectrum of nuclear energy research, development and testing programs:

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- **Nuclear engineering design and research.** INL advances future generations of peaceful nuclear technology through projects including fusion reactor safety, Generation IV reactor research, advanced reactor design and analysis, safety and thermal-fluid experiments, and joint management of three Department of Energy nuclear university programs.
- **Nuclear and radiological sciences.** INL is researching and developing technology in areas of fundamental low-energy nuclear physics, medical applications of radiological science and advanced radiation detection systems.
- **Safety.** INL advances the safety of nuclear technology through development and application of advanced analytical tools, supporting the U.S. Nuclear Regulatory Commission in analyzing facility and process risk and reliability, conducting safety analyses of specific facilities, and leading the nation's Fusion Safety Program.

### **Spearheading Tomorrow's Peaceful Nuclear Technologies**

Building on its role as the nation's leading center of nuclear energy research and development, INL is looking to the future and devoting significant resources to advance three crucial nuclear energy priorities:

- **The Generation IV nuclear reactor project.** INL is leading development in the U.S. of the next generation of nuclear energy systems. This "Generation IV" re-



The INL is leading an international coalition with 11 members in the development of the next generation of nuclear energy systems.

actor will provide electricity and allow large-scale, emissions-free production of hydrogen for tomorrow's automobiles. INL is currently conducting research on six nuclear energy systems as part of an international effort to see which best meets Generation IV's stringent sustainability, economic, safety, reliability and non-proliferation goals.

- **The Nuclear Power 2010 program.** INL is working to advance Nuclear Power 2010, a joint government/industry cost-shared program to demonstrate new regulatory processes and to provide certified designs that will lead to the start of new nuclear power plants in the United States by 2010.
- **The Advanced Fuel Cycle.** INL is developing technologies that can safely and effectively separate useful components of used

nuclear fuel from wastes in a way that preserves proliferation resistance while reducing the need for used fuel storage space.

### **Goals for Generation IV Nuclear Energy Systems**

#### **Sustainability 1**

Generation IV nuclear energy systems will provide sustainable energy generation that meets clean air objectives and promotes long-term availability of systems and effective fuel utilization for worldwide energy production.

#### **Sustainability 2**

Generation IV nuclear energy systems will minimize and manage their nuclear waste and notably reduce the long-term stewardship burden in the future, thereby improving protection for the public health and the environment.

#### **Economics 1**

Generation IV nuclear energy systems will have a clear life-cycle cost advantage over other energy sources.

#### **Economics 2**

Generation IV nuclear energy systems will have a level of financial risk comparable to other energy projects.

#### **Safety and Reliability 1**

Generation IV nuclear energy systems operations will excel in safety and reliability.

#### **Safety and Reliability 2**

Generation IV nuclear energy systems will have a very low likelihood and degree of reactor core damage.

#### **Safety and Reliability 3**

Generation IV nuclear energy systems will eliminate the need for offsite emergency response.

#### **Proliferation Resistance and Physical Protection**

Generation IV nuclear energy systems will increase the assurance that they are a very unattractive and least desirable route for diversion or theft of weapons-usable materials, and provide increased physical protection against acts of terrorism.

### **For More Information**

#### **Management Contact:**

Ralph Bennett  
208-526-7708  
Ralph.Bennett@inl.gov

#### **Information Contact:**

Teri Ehresman  
208-526-7785  
Teri.Ehresman@inl.gov



The INL is one of the U.S. Department of Energy's multiprogram national laboratories, and is managed by Battelle Energy Alliance, LLC.